U.S. Department of Health and Human Services
NIH News
National Institutes of Health

National Institute on Drug Abuse
http://www.drugabuse.gov/

FOR IMMEDIATE RELEASE
Monday, March 15, 2010

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Impulsive-Antisocial Personality Traits Linked to a Hypersensitive Brain Reward System

New Study Sheds Light on a Neurochemical Vulnerability that Could Contribute to Psychopathic Behaviors

Normal individuals who scored high on a measure of impulsive/antisocial traits display a hypersensitive brain reward system, according to a brain imaging study by researchers at Vanderbilt University. The findings provide the first evidence of differences in the brain's reward system that may underlie vulnerability to what's typically referred to as psychopathy.

The study in the current issue of the journal Nature Neuroscience was funded by the National Institute on Drug Abuse (NIDA), a component of the National Institutes of Health.

Psychopathy is a personality disorder characterized by a combination of superficial charm, manipulative and antisocial behavior, sensation-seeking and impulsivity, blunted empathy and punishment sensitivity, and shallow emotional experiences. Psychopathy is a particularly robust predictor of criminal behavior and recidivism.

Since psychopathic individuals are at increased risk for developing substance use problems, the Vanderbilt team decided to investigate possible links between the brain's reward system (activated by abused substances and natural reward), and a behavioral trait (impulsive/antisociality) characteristic of psychopathy. Researchers used two different technologies to measure the brain's reward response.

In the first experiment, positron emission tomography (PET) was used to image the brain's dopamine response in subjects who received a low oral dose of amphetamine. Dopamine is a brain chemical associated with reward and motivation.

In the second experiment, the same subjects participated in a game, in which they could make (or lose) money while their brains were being scanned using functional magnetic resonance imaging (fMRI) .

The results in both cases show that individuals who scored high on a personality assessment that teases out traits like egocentricity, manipulating others, and risk taking had a hypersensitive dopamine response system. The picture that emerges from these high resolution PET and fMRI

scans suggests that alterations in the function of the brain's reward system may contribute to a latent psychopathic trait.

The researchers speculate that a heightened response to an anticipated reward could make such individuals less fearful about the consequences of their behavior, which, combined with a reduced sensitivity to others' emotions and resistance to learning from mistakes, could lead to the manipulative and aggressive style of behaviors that is common in psychopaths.

The traits analyzed in this study have been previously shown to predict antisocial behavior and substance abuse in both incarcerated and community samples.

"By linking traits that suggest impulsivity and the potential for antisocial behavior to an overreactive dopamine system, this study helps explain why aggression may be as rewarding for some people as drugs are for others," said NIDA Director Dr. Nora Volkow. "However, while having an antisocial trait may be a driving factor, it is clearly not sufficient to trigger aggressive behaviors; thus, we need to continue to investigate the other contributors to psychopathy."

While the Vanderbilt researchers believe they've made an important first step showing that characterizations of psychopathic behavior are closely related to changes in brain activity, they hope to validate their findings with new studies on individuals who have been actually diagnosed as psychopaths.

"The amount of dopamine released was up to four times higher in people with high levels of these traits, compared to those who scored lower on the personality profile," says Joshua Buckholtz, doctoral candidate in neuroscience and the lead author of the study.

"Because of these exaggerated dopamine responses, individuals with a latent psychopathic trait may become focused on a chance to get a reward, and less able to shift their attention until they get what they're after. This pattern, along with other traits, could develop into psychopathic personality disorder."

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